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Progress toward coupled flux qubits with high connectivity and long coherence times STEVEN WEBER, DAVID HOVER, DANNA ROSENBERG, GABRIEL SAMACH, JONILYN YODER, ANDREW KERMAN, WILLIAM OLIVER, MIT Lincoln Laboratory — The ability to engineer interactions between qubits is essential to all areas of quantum information science. The capability to tune qubit-qubit couplings *in situ* is desirable for gate-based quantum computing and analog quantum simulation and necessary for quantum annealing. Consequently, tunable coupling has been the subject of several experimental efforts using both transmon qubits and flux qubits. Recently, our group has demonstrated robust and long-lived capacitively shunted (C-shunt) flux qubits. Here, we discuss our efforts to develop architectures for tunably coupling these qubits. In particular, we focus on optimizing the RF SQUID coupler to achieve high connectivity. This research was funded by the Office of the Director of National Intelligence (ODNI), Intelligence Advanced Research Projects Activity (IARPA) and by the Assistant Secretary of Defense for Research Engineering under Air Force Contract No. FA8721-05-C-0002. The views and conclusions contained herein are those of the authors and should not be interpreted as necessarily representing the official policies or endorsements, either expressed or implied, of ODNI, IARPA, or the US Government.

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